

TECHNICAL NOTES  
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

---

NO. 87.

---

N.A.C.A. CONTROL POSITION RECORDER.  
By F. H. Norton,  
Langley Memorial Aeronautical Laboratory.

---

May, 1922.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

---

TECHNICAL NOTE NO. 97.

---

N.A.C.A. CONTROL POSITION RECORDER.

By F. H. Norton.

Summary.

A new instrument is described which is capable of simultaneously recording the position of the three controls of an airplane. The records are taken photographically on a standard N.A.C.A. film drum and the instrument can be quickly installed in any airplane. The instrument is of value not only for scientific research on stability and controllability, but also as a means of checking up the flying of pilots.

---

The instrument as shown in Fig. 1 consists essentially of the base plate and film drum mounting used on all the N.A.C.A. recording instruments. The constant speed driving motor (1) rotates the film clutch (2) at a speed of about 1 r.p.m. through worm gearing in the base. The motion of the controls is transmitted to the instrument through the cords (3) which are wrapped around three drums (4). The drums are mounted on a horizontal screw and contain a spiral spring which keeps the cords wound tightly. Thus a 12-inch motion on the end of the cord is convert-

ed into a 3/16 inch lateral motion of the drum. This motion is transmitted by a system of levers (5) to the three mirrors (6) which reflect the light beam onto the film through the lens (7) in the same way as with the other N.A.C.A. recording instruments. As three separate records are superimposed on one film it is necessary to have some way of distinguishing between them. This is accomplished by revolving slowly in front of two of the mirrors a sector shutter (8). One mirror therefore gives a continuous line, one a dotted line, and one a dash line.

The cords can be connected directly to any convenient portion of the control system, but if it is desired to have a high degree of accuracy it is advisable to run small steel wires to the control horns so that any backlash in the control systems may be eliminated. If this is done a precision of  $1/4^{\circ}$  can be easily obtained, and this is quite sufficient for any ordinary work. The instrument is calibrated in place by setting the control surfaces to given angles and taking a short record on the film for each setting.

Some records taken by this instrument on a JN4h are shown in Fig. 2. Although they are not as clear as the original film the different records can be distinguished. The curves are usually replotted by measuring the distances on the film from the zero line and then multiplying by the calibration constant to give the true angle in degrees. These angles are then plotted against a time base so as to agree with the records from other instruments.

The record of the landing shows the three-second vertical timing lines placed on the film by a light in the instrument case which is connected, together with timing lights in other instruments, to an electric chronometer.

This instrument has been used mainly by the National Advisory Committee for Aeronautics in the study of stability, controllability and maneuverability. For this work a knowledge of the position of the controls is essential but the method formerly used of reading the angle visually was too slow and inaccurate for most of the work. This instrument will obtain more data in a few minutes' flight than could be obtained before in flights of many hours, so that the cost of this kind of research has been greatly reduced by this means. Another use of this instrument is for the study of control movements in various types of maneuvers. This is quite important as the pilot cannot remember exactly how he moves his controls in order to execute a given stunt. It would also be of considerable value to check up on new pilots and to show them how their execution of a maneuver differs from that of a skilled pilot.

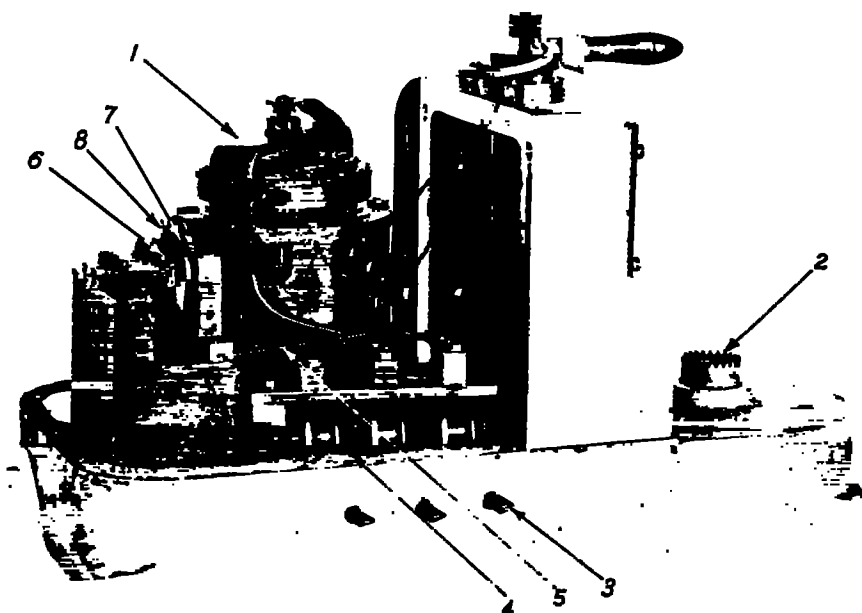
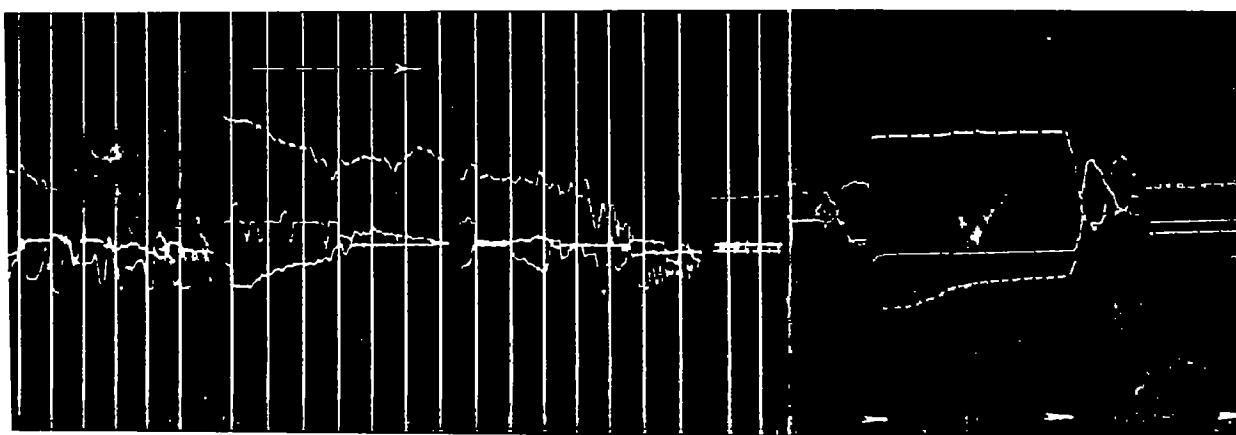


Fig. 1. Control position recorder.



Landing Tail spin  
Fig. 2. Records from the instrument.

8397.A.S.